Illustration of a caterpillar of Megalopyginae (Lepidoptera: Megalopygidae) whose hairs contain antiseptic compounds

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Abstract: The cloth of hairs as well as different types of setae of an undetermined species of Megalopyginae are shown. Long hairs with broadened tips form a dense "shell" surrounding the larva. Short stinging bristles or spines are located between the former. The hairs, together with secondary compounds contained in them, probably serve for defense from pathogenic microorganisms, on the one hand, and from predators such as ants and birds, on the other hand.

Key words: chemical defense, hairs of caterpillars, Lepidoptera, Megalopygidae, Megalopyginae, secondary compounds

Abbildung einer Raupe einer Megalopyginae-Art (Lepidoptera: Megalopygidae) mit antiseptischen Substanzen in den Haaren

Zusammenfassung: Das Haarkleid sowie verschiedene Haartypen einer Raupe einer unbestimmten Art der Megalopyginae werden abgebildet. Lange Haare mit verbreiterten Spitzen bilden eine dichte „Schale" um die Larve herum. Zwischen den langen Haaren sitzen kurze Stechborsten oder Stacheln. Die Haare mit den enthaltenen Sekundärstoffen dienen wahrscheinlich der Verteidigung einerseits gegen pathogene Mikroorganismen, andererseits gegen Räuber wie Ameisen und Vögel.

Introduction

Flannel moths (Lepidoptera: Zygaenoidea, Megalopygidae) are a mainly Neotropical family whose larvae ("fire caterpillars") have long been known to affect human skin by means of piercing, irritant hairs (Kawamoto & Kumada 1984). Since Gilmer's (1925) pioneering work on venomous hairs of caterpillars, numerous research papers and reviews containing data on pharmacological and other medically relevant aspects of the setal venoms of Megalopygidae have appeared (e.g., Weidner 1937, Maschwitz & Kloft 1971, Pesce & Delgado 1971, Delgado Quiroz 1978, Kawamoto & Kumada 1984). Some hairs or spines have been shown to contain damaging proteins (e.g., hyaluronidase and hemolytic/proteolytic polypeptides) as well as, possibly, small amounts of histamine.

Only recently, Deml & Epstein (2001) investigated the low-molecular weight compounds occurring in tufts of larval setae of an unidentified species of Megalopyginae which exhibited a "very strong irritant effect" (Ziereis, personal communication), by combined gas chromatography/mass spectrometry. From the larval hairs several secondary compounds were identified: three main components (hydroquinone, nicotine, isopropyl myristate) and three trace compounds (benzaldehyde, phenol, nicotinamide). An exact identification of the animal was impossible because many hairy Megalopygidae larvae (Megalopyginae presently comprise 74 Neotropical species in three genera: *Megalopyge*, *Podalia*, *Psychagrapha*) distinctly resemble each other. By way of completion, this paper is to illustrate the habitus and some setal peculiarities of the investigated caterpillar.

Materials and methods

A living caterpillar of a Megalopyginae from Venezuela was given to the first author by Mr. F. Ziereis (Cham/Germany). The larva was further reared at 22 °C and 60–70% relative humidity and fed only on willow (*Salix caprea* L.; Salicaceae). The larva molted twice (final body length about 1.5 cm, without considering the hairs). Then it had been killed and chemically analyzed. It was this chemically investigated instar that was also photographed.

Results and discussion

Due to its hairy coating (Figs. 1–3), the uniformly dark-brown larva resembled the "puss caterpillar" type of Megalopygidae (Stehr 1987). In general, megalopygid larvae have verrucae bearing several types of hairs such as short stiff bristles and long, partially plumose setae with spatulated and barbed tips. Already Packard (1894) provided detailed description of these verrucae and illustrations of them both internally and externally. The presence of two types of setae on verrucae is true also for the one larva in question.

Long, light reddish brown hairs are projecting particularly from the lateral verrucae. Some of these setae are bent downwards (ventrodistad), then outwards, which gives the larva the impression of an "air-cushion craft", others extend upwards (dorsomediad), thereby forming a "dome" or "umbrella" beyond the larva (Figs. 1, 2). Due to these three-dimensional setal arrangements which seemingly treble the larva's medial diameter, the total caterpillar can be photographed only with difficulty; one gets only cross-sectional views of the hairy structures.

Short, stiff, and pointed spines (or bristles) are located between the long hairs of the Megalopyginae larva under consideration (Fig. 4). The spines differ somewhat regarding length and thickness (see Fig. 4); by analogy with Baerg (1924), the shorter ones are not poisonous but the longer ones are. At least the latter are filled with a liquid (personal observations) and probably contain dermatologically active substances as is the case with the spines of other megalopygids (Maschwitz & Kloft 1971).

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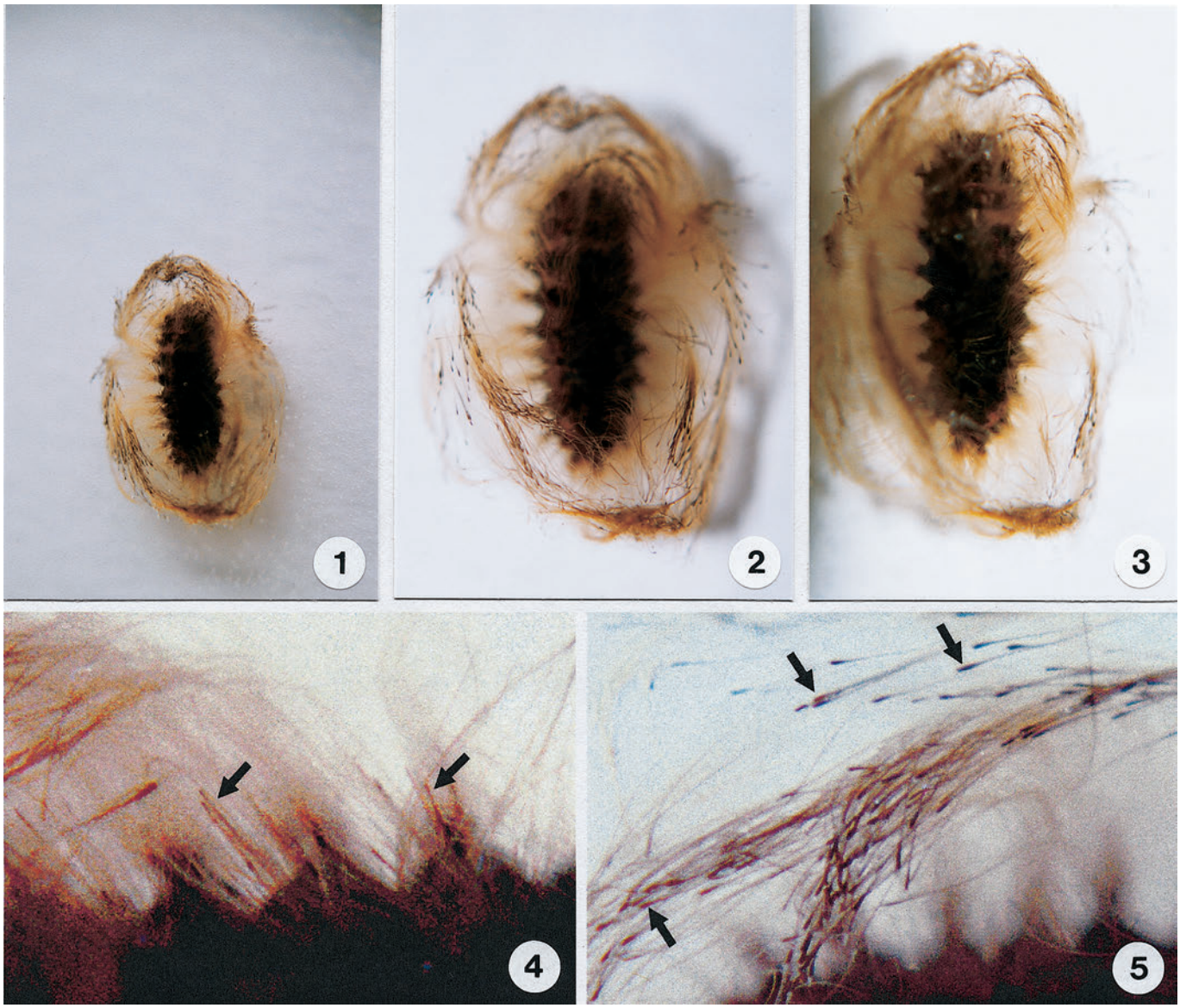

Plate: Photomicrographs of a caterpillar of Megalopyginae (body length about 1.5 cm) and its hairs. **Fig. 1:** Dorsal view, showing the "shell" of long hairs the larva is surrounded by. **Fig. 2:** Dorsal view at larger magnification. **Fig. 3:** Ventral view at larger magnification. **Fig. 4:** Short, stiff, and pointed spines (or bristles) of varying size (arrows), probably containing urticating substances. **Fig. 5:** Long hairs with widenings at their tips (arrows).

The dark tips of the long hairs are distinctly thickened, the biological significance of which is unclear (Fig. 5). However, it is assumed that such hairs of Megalopygidae may not be simply ornamental but may get contaminated by the toxin which is produced by and released from the hollow spines, and thereby spread it (Pesce & Delgado 1971, Epstein 1996).

The "shell" produced by the long hairs of the caterpillar could be relevant for defense from enemies. According to Deml & Epstein (2001), two substances (hydroquinone, phenol) in the larval hairs (which unfortunately were not distinguished) are very effective antiseptics and antiphlogistics. Since the dense hairy arrangements generate "calm" spaces surrounding the larva, a disinfectant defense against pathogenic microorganisms growing in this humid microclimate could be most advantageous. Simultaneously, the partially repellent secondary compounds could substantially strengthen the larval defenses (combined with the hairs) against predators such as ants or birds; such effects would need to be verified by observations of defensive interactions of such caterpillars in the field. Nevertheless, the presented findings are a promising starting point for further morphological, histological, and chemical examinations of hairs of Megalopygidae.

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Personalia

Nachträge zur Bibliografie von Werner Thomas, 3. — Supplements to the bibliography of Werner Thomas, 3.

Nach der Publikation der Bibliografie von Werner Thomas (Nässig 1993) und den beiden Nachträgen dazu (Nässig 1997, 1998) wurde ich freundlicherweise von J. J. de Freina auf eine fehlende Publikation aufmerksam gemacht, die mir entgangen war (de Freina & Witt 1994). Diese Publikation war ursprünglich zur Publikation in der Zeitschrift „Entomofauna“ vorgesehen (siehe Nässig 1993: 272). Die folgenden Angaben dienen als 3. Nachtrag zur Fortschreibung der bibliografischen Angaben über Werner Thomas.

After the publication of the bibliography of Werner Thomas (Nässig 1993) and the two supplements (Nässig 1997, 1998) I have been sent a publication by J. J. de Freina which had escaped by eyes before (de Freina & Witt 1994). This paper was originally intended for publication in the journal “Entomofauna” (see Nässig 1993: 272). The following is the 3rd supplement to Werner Thomas’ bibliography.

Neues Patronym/New patronym:

Lithosarctia ***thomasi*** de Freina & Witt, 1994: Atalanta, Marktleuthen, **25** (3/4): 540 (locus typicus: Nepal, Manong, Lamjung-Himal, holotype in coll. Museum Witt, München [Munich], later to be deposited in ZSM, München [Munich]) (Arctiidae).

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